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(57) A relatively dry, thermally stable, feed premix comprising a pelleted mixture of a physiologically acceptable carrier, for example, a grain flour, and one or more enzymes, is produced by mixing the ingredients, reacting the mixture to absorb the enzyme or enzymes into the carrier, and pelletizing the reacted mixture.

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
DOCUMENTS CONSIDERED TO BE RELEVANT			
X	US-A-3 898 131 (P.A. HAHN et al.) * Column 7, lines 23-25; column 8, claims 1-3 *	1,7,10	A 23 K 1/165
X	POULTRY SCIENCE, vol. 65, no. 1, 1986, pages 72-77, Champaign, US; M.J. ENDY et al.: "Afforestation of a simple radial gel diffusion assay for endo-beta-glucanase activity in dietary enzyme supplements"	1,6,7	A 23 K 1/00
X	US-A-3 701 830 (B.W. WEINRICHT et al.) * Column 1, abstract; column 4, lines 49-60 * --- * Page 75, left-hand column, last paragraph - page 76, left-hand column, last but one paragraph * --- * Examples 1,9,10 * * Claims 1,5,8,13-15,17; page 15, lines 9-12; examples 1,9,10 *	1,4,6,7	X
X	AU-A- 548 773 (D.J. KINGSTON et al.) --- * Claims 1,5,8,13-15,17; page 15, lines 9-12; examples 1,9,10 *	1,6,7	X
X	GB-A- 644 988 (R.P. DUNMIRE) * Page 1, lines 30-40, 43-51, 62-73, 81-88 * Page 3, lines 105-115 * --- * EP-A-0 105 051 (THE QUAKER OATS CO.) * Claims 1,3,5,6,10 * --- * EP-A-0 113 626 (SANDERS) * Page 8, lines 1-5; page 9, claims 1,6 --- * US-A-4 218 437 (G. HILLER) * Column 3, lines 48-58 *	1,4,5 1,6,7 1 1,7	A A A D,A
TECHNICAL FIELDS SEARCHED (Int. Cl. 4)			
The present search report has been drawn up for all claims			
THE HAGUE			
DEKIEREL M.J.			
Examiner			
Date of completion of the search			
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CATEGORY OF CITED DOCUMENTS			
T : theory or principle underlying the invention E : earlier patent documents, but published on, or X : particularly relevant if taken alone Y : particularly relevant if combined with another A : document cited in the application D : document cited for other reasons L : document filed for filing sake E : member of the same family, corresponding P : intermediate document O : non-written disclosure			
(1) SEARCHED			



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bottom region thereof, the vessel (10) has a discharge means (11) for the material in the vessel. The plant is insulated and/or heated. A discarge opening (6, 7) is attached to a vessel (10) for receiving material from the housing (4) through the discharge opening (6, 7). In a granulate or particulate material. The housing (4) has an inlet (13) for the supply of steam to the material in the housing (4), an insulating opening (5) in the housing, a discharge opening (6, 7) in the housing and agitator means (2, 3) provided inside the housing, and the housing (4) is closed after a sterilization is carried out in a plant which includes a housing (4), an insulation chamber (5) in the housing, a sterilization chamber (6) in the housing, the material is passed directly into a residue vessel from where the material is heated by a supply of steam. After sterilization and heating, the material is aggregated to a fluid state in the first chamber whilst it is maintained at that temperature for a necessary residence time. The material is sterilized to a fluid state in the first chamber when sterilizing a granulate or particulate material, steam is added to the material in order to heat it to sterilization temperature and whilst it is heated a sterilized residue time. The material is aggregated directly into a residue vessel from where the material is sterilized after a sterilization and heating. The material is sterilized to a fluid state in the first chamber whilst it is heated by a supply of steam. After sterilization and heating, the material is aggregated to a sterilization time. The material is sterilized to a sterilization and heating. The material is sterilized to a sterilization time.

(57) Abstract

(54) Title: METHOD OF STERILISING GRANULATE AND PARTICULATE MATERIAL AND MEANS IN A MIXING APPARATUS

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35 The high temperature damages a part of the grain (feed), which becomes difficult to digest. Other parts of the grain become easier to digest, but this may again be achieved

costly and energy-consuming.

30 A short residence time requires high temperature and adequate moisture. In this case, the temperature typically may be 120°C. The costs of generating this temperature are very high, both in terms of running costs and in the purchasing of equipment. Today it is typical to use expanders or extruders for this part of the process, and this is very

25 sterilisation, i.e., the directive that all feed must be heated to a minimum temperature of 80°C and kept at this temperature for a sufficient period of time.

Today's equipment in animal feed factories is not capable of handling the required sterilisation, i.e., the directive that all feed must be heated to a minimum temperature of

20 relatively harmless to the deadly. Today, researchers have identified 2000 variants of salmonella bacteria ranging from the greatest that in many places on the continent it is not possible to buy soft-boiled eggs or fried eggs as the heat treatment of the yoke is inadequate. Similarly, meat may be infected with salmonella and the consumption thereof may have a disabling result.

15 The problem which has resulted in long-term sick leave and at times even a fatal outcome. The invention has been especially developed in connection with the need to render harmless salmonella bacteria in animal feed. Salmonella has become a growing problem which has now grown to such proportions that the EU has directed that all animal feed is to be heated to a minimum of 80°C. From research into the problem complex, it is known that heating to a temperature of 80°C without a residence time will not render the salmonella bacteria harmless, as this requires a combination of temperature,

10 material is maintained at this temperature for a necessary residence time. The invention relates to a method of sterilising granulate and particulate material, wherein steam is added to the material to heat it to sterilisation temperature and the material is maintained at this temperature for a necessary residence time.

Method of sterilising granulate and particulate material and means in a mixing apparatus

35 material.

and agitator means provided inside the housing for fluidising a granulate or particulate includes a housing, an intake opening in the housing, a discharge opening in the housing The invention also relates to a means in a mixing apparatus, which mixing apparatus

30 transferred directly to the residence vessel. Similarly, it may be advantageous if, after agitation and heating, the material is gravity-

It is especially advantageous to use overheated steam.

25 procurement of a residence vessel and insulation of existing mixing plant). One particular advantage of the invention is that the method can be carried out in connection with already existing equipment, modified in a very simple manner (procurement of a residence vessel and insulation of existing mixing plant).

20 . The transfer to a residence vessel ensures necessary residence time for complete destruction of salmonella bacteria in particular. When agitating the material to a fluid state, as is known from a mixing apparatus commonly used in animal feed factories, and which may be one of various kinds, it will be possible to reach a sufficiently high temperature, e.g., 90-95°C, by introducing steam into a residence vessel, and that after agitation and heating the material is passed directly by a supply of steam, and that after agitation and heating the material is discarded that the granulate and particulate material is agitated to a fluid state whilst being heated according to the invention, a method is proposed as mentioned above, characterised in that the granulate and particulate material is discarded after the desired residence time.

15 Researches have asserted that even a temperature as low as 71°C and a residence time of three minutes, combined with 16 to 17% moisture in the product, will effectively kill salmonella.

10 Researchers have asserted that even a temperature as low as 71°C and a residence time of three minutes, combined with 16 to 17% moisture in the product, will effectively kill salmonella.

5 Thus, there is a need to find a simpler way to "sterilise" animal feed than the methods used today, both as regards operations and in terms of investments.

the high temperature causes. Thus, by using a lower temperature for a longer time without the damaging side-effects that

35 According to the invention, the vessel advantageously has a discharge device in the bottom region thereof, the discharge device may be a horizontal feed screw and may to advantage be progressive, in order thereby to maintain a desired horizontal free surface for the material in the residence vessel.

30 Costs in order to bring the temperature back down to ambient temperature, apparatus/conditioning and will involve only slightly higher costs for heating than, e.g., expanders which supposedly raise the temperature of the product to 120°C, which in turn requires higher higher temperature, but considerably lower costs for heating than, e.g., expanders which product is already heated, the energy used for this will be channelled into the mixing apparatus.

25 The invention will help considerably to reduce investments. Since, in today's plants the time cannot be used. The running costs would be very high in such a case. expanders in order to elevate the temperature sufficiently, because a prolonged residence common in feed factories today, a major investment must be made in expanders or against salmineilla is obtained. If such protection is to be obtained by using the plants required is lower than today's investment, and in addition the protective cascade mixers and pellet processes can be dispensed with. The cascade mixer on the pellet press may be dispensed with, and thus overall in terms of investments the sum under the mixing apparatus. Moreover, the invention also means that silos before like, since existing space in the factory can be used. The vessel is very simply arranged of costs, the invention will result in great advantages for animal feed factories and the supplied steam to the mixing apparatus, where the mixing that takes place therein. In terms agitated to a fluid state in connection with the granulate or particulate material is the sterilisation of the feed by means of heating to a sterilisation temperature by said material receiving vessel can be used as a residence vessel in connection with 10

15 The said material receiving vessel should have an inlet for the discharge opening.

According to the invention, it is proposed that the housing should have an inlet for the supply of steam to the material in the housing, and that the housing discharge opening should be attached to a vessel for receiving material from the housing through the

an elevator to a silo, a conditioning system and a pellet press.

where a typical diagram would be a weighing system, a mixing apparatus, a receptacle, A mixing apparatus of this kind is a common piece of equipment in feed factories,

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6, 7.

in the mixing apparatus I can fall straight down, through the opened discharge openings 6, 7 there is provided a residence vessel 10 into which the product processed in direct connection with the lower part of the mixing apparatus around the discharge

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opening 5 can, after mixing, be discharged through the discharge openings 6, 7 open discharge position so that the product poured into the housing 4 through the intake slitudes 8, 9 which in Fig. 1 are indicated with broken lines and are swung down into an bottom region. The discharge openings 6, 7 can be opened and closed by means of

The mixing apparatus I has an intake opening 5 and two discharge openings 6, 7 in the

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mixing process.

particulate material with which the housing 4 is filled, and fluidise the product during a motor-powered shafts provided with blades or paddles which beat the granulate or that is described in EP 219471. A mixing apparatus of this kind has two horizontal apparatus housings 4. The mixing apparatus I may, for example, be of the general type that is described in EP 219471. A mixing apparatus of this kind has two horizontal units 2, 3 in the

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The drawings show a mixing apparatus I having two horizontal paddle units 2, 3 in the

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Fig. 2 is a vertical section 90° to the section in Fig. 1.

Fig. 1 is a vertical section through a means according to the invention; and

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drawings, wherein:

The invention will now be described in more detail with reference to the schematic

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vessel is at least 1.7 times that of the housing.

It is especially advantageous according to the invention if the volume of the vessel is

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larger than that of the housing. It is particularly advantageous if the volume of the

agitator means may include two interacting horizontal paddle rotors.

portion of the housing.

The stream inlets are advantageously located according to the invention in a lower

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According to the invention, it is advantageous if both the housing and the vessel are thermally insulated, or have external heating or a combination of both.

The invention provides the advantage that it is possible to use a mixing apparatus which is already an integrated part of a feed production and which exists in several different types. The only departure is that the apparatus should be insulated and partly heated to avoid cold surfaces which may cause the salmonella bacteria to survive. Similarly, a vessel 10 must be provided where the product can be kept for a minimum of three minutes, so that the necessary residence time in the system is obtained. In the plant 35

electrically or by using a steam loop. The plant may to advantage be insulated, as indicated by means of the reference numeral 14, and optionally externally heating (not shown) may also be provided, in addition to or instead of insulation. The heating may, for example, take place

through the opening 12 by means of feed screws 11 and preferably concurrently with the sterilisation. After the desired residence time in the vessel, the product is conveyed out through the opening 12 by means of feed screws 11 and preferably concurrently with the sterilisation. A fresh quantity of product can then be poured into the mixing apparatus for mixing and sterilisation. The product has been transferred to the vessel 10 will remain in the vessel 10 for a period of time necessary to obtain of the requisite mixing and sterilisation. When mixing apparatus openings 6, 7 are opened, the material in agitators 2, 3 are stopped and the discharge openings 6, 7 are opened. The material in the mixing apparatus will then fall straight down into the vessel 10. The sluices 8, 9 are closed. A fresh quantity of product can then be poured into the mixing apparatus for sterilisation. After the desired residence time in the vessel, the product is conveyed out through the opening 12 by means of feed screws 11 and preferably concurrently with the sterilisation. The product has been transferred to the vessel 10 will remain in the vessel 10 for a period of time necessary to obtain of the requisite

sterilisation. A fresh quantity of product can then be poured into the mixing apparatus for mixing and sterilisation. The product has been transferred to the vessel 10 will remain in the vessel 10 for a period of time necessary to obtain of the requisite sterilisation. After the desired residence time in the vessel, the product is conveyed out through the opening 12 by means of feed screws 11 and preferably concurrently with the sterilisation. The product has been transferred to the vessel 10 will remain in the vessel 10 for a period of time necessary to obtain of the requisite sterilisation. A fresh quantity of product can then be poured into the mixing apparatus for mixing and sterilisation. The product has been transferred to the vessel 10 will remain in the vessel 10 for a period of time necessary to obtain of the requisite sterilisation. A fresh quantity of product can then be poured into the mixing apparatus for mixing and sterilisation. The product has been transferred to the vessel 10 will remain in the vessel 10 for a period of time necessary to obtain of the requisite sterilisation.

The mixing apparatus 1 is provided with a plurality of steam nozzles 13 through which steam can be fed into the mixing apparatus. These steam nozzles are arranged advantageously in the lower region of the mixing apparatus beneath the agitators 2, 3. The mixing apparatus 1 has a funnel-shaped lower region wherein at the bottom there is provided a progressive feed screw 11 which conveys the product out of the residence

vessel 10 through an opening 12. The residence vessel 10 has a funnel-shaped lower region wherein at the bottom there is provided a progressive feed screw 11 which conveys the product out of the residence

As mentioned, the mixing apparatus may be one of many different types. The requirement is that it must be capable of fluidising the product, so that a very efficient mixing of the steam into the feed or product is achieved, in order thereby to obtain the sufficient, uniform temperature increase in the product.

It is advantageous to provide a level control in the vessel 10, which prevents the vessel from being emptied to a level that is too low before the next quantity arrives from the mixing apparatus, or alternatively prevents the quantity added from entering too soon before the vessel has been sufficiently emptied. This is to guarantee a correct residence time in the system.

The steam may be overheated to better balance the quantity of moisture which is added to the product.

According to the invention, it is possible in a simple manner to obtain a desired temperature, residence time and moisture in order to satisfy the requirements made with respect to a sterilisation of the feed product.

1. A method of sterilising a particulate or granulate material wherein stream is added to the material in order to heat it to sterilisation temperature in a chamber and after heating is transferred directly to a second chamber and is maintained therein for a necessary residence time before discharge, characterised in that a quantity of material is agitated to a fluid state in the first chamber whilst it is heated by a supply of steam, and that after heating the quantity of material is mixed apparatus, which mixing apparatus includes a housing (4), an intake opening (5) in the housing, a discharge opening (6, 7) in the housing and agitator means (2, 3) provided inside the housing for fluidising a granulate or particulate means (2, 3) provided inside the housing for fluidising a granulate or particulate vessel (10) for receiving material from the housing (4) through the discharge opening (6, 7) is attached to a material in the housing, and that the housing discharge opening (6, 7) is attached to a vessel (10) for receiving material from the housing (4) through the discharge opening (6, 7).
 2. A means in a mixing apparatus, which mixing apparatus includes a housing (4), an intake opening (5) in the housing, a discharge opening (6, 7) in the housing and agitator means (2, 3) provided inside the housing for fluidising a granulate or particulate material, characterised in that the housing (4) has an inlet (13) for the supply of steam to the material in the housing, and that the housing (4) has a bottom region.
 3. A means according to claim 2, characterised in that the vessel (10) in a bottom region thereof has a discharge means (11) for the material in the vessel.
 4. A means according to claim 2, characterised in that the vessel (10) in a bottom region thereof has a discharge means (11) for the material in the vessel.
 5. A means according to claim 3, characterised in that the discharge means (11) is a horizontal feed screw.
 6. A means according to claim 4, characterised in that the horizontal feed screw (11) is progressive.

A means according to one of the preceding claims 2-6, characterised in that the volume of the vessel (10) is greater than the volume of the housing, preferably at least 1.75 of the volume of the housing.

7.